PALM INTRANET

Inventor Information for 09/759649

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Appln Info | Contents | Petition Info | Atty/Agent Info | Continuity Data | Foreign Data | Inventor

Search Another: Application# [   ] Search   or Patent# [   ] Search

PCT / [   ] / [   ] Search   or PG PUBS # [   ] Search

Attorney Docket # [   ] Search

Bar Code # [   ] Search

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2-3-05

h   e   eb   cg b e   e f   e

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Continuity Information for 09/759649

Parent Data
09759649
Claims Priority from Provisional Application 60176397

Child Data
No Child Data

| Appln Info | Contents | Petition Info | Atty/Agent Info | Continuity Data | Foreign Data | Inventors | Add |

Search Another: Application# [＿＿＿] Search **or Patent#** [＿＿＿] Search

PCT / [＿＿] / [＿＿] Search **or PG PUBS #** [＿＿＿] Search

Attorney Docket # [＿＿＿＿＿] Search

Bar Code # [＿＿＿＿] Search

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*Checked
ERC
2-3-05*

h   e   eb   cg b e   c

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	79690	(estimate or estimated or estimating or estimation or predict or predicted or predicting or prediction or approximate or approximated or approximating or approximation or determine or determined or determining or determination) near5 (ink or toner or color)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:25
2	BRS	L2	2744	1 near5 (cost or costing or price or pricing or rate or rating or fee or feeing or charge or charges or charging or bill or billing)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:25
3	BRS	L3	81256	red near5 (cyan or magenta or yellow or black or (color near space))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:25
4	BRS	L4	66734	green near5 (cyan or magenta or yellow or black or (color near space))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:25
5	BRS	L5	65462	blue near5 (cyan or magenta or yellow or black or (color near space))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:26
6	BRS	L6	20880	3 same 4 same 5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:26

	Type	L #	Hits	Search Text	DBs	Time Stamp
7	BRS	L8	47626	(optical or light) near5 (ink or print)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:26
8	BRS	L9	1764	6 and 8	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:27
9	BRS	L10	145695	(density or area or coverage or darkness) near5 (ink or toner or color)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:27
10	BRS	L11	207	2 near10 10	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:27
11	BRS	L12	209	2 and (8 or 9) and (10 or 11) *Scanned Ti,Ab,Kwic all*	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 22:30
12	BRS	L13	80	("5383129" or "9936835" or "217503" or "0217503").pn. or ((@pd<="19710101" not @pd<="19470101") and (345/589 or 345/604 or 356/402 or 382/100 or 382/162 or 705/400 or 715/526 or 715/527 or 715/528).ccls.) *Scanned Ti all*	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	2005/02/03 23:10

	Document ID	Issue Date	Inventor	Current OR	Current XRef	Pages
1	WO 9936835 A1	19990722	MOTAMED, MARGARET			21
2	US 5383129 A	19950117	Farrell; Michael E.	705/400	377/13; 377/15; 399/79; 399/81	19

L13 results

File   2:INSPEC 1969-2005/Jan W4 (c) 2005 Institution of Electrical Engineers
File   9:Business & Industry(R) Jul/1994-2005/Feb 03 (c) 2005 The Gale Group
File   15:ABI/Inform(R) 1971-2005/Feb 03 (c) 2005 ProQuest Info&Learning
File   16:Gale Group PROMT(R) 1990-2005/Feb 03 (c) 2005 The Gale Group
File   20:Dialog Global Reporter 1997-2005/Feb 03 (c) 2005 The Dialog Corp.
File   35:Dissertation Abs Online 1861-2005/Jan (c) 2005 ProQuest Info&Learning
File   65:Inside Conferences 1993-2005/Jan W5 (c) 2005 BLDSC all rts. reserv.
File   99:Wilson Appl. Sci & Tech Abs 1983-2004/Nov (c) 2005 The HW Wilson Co.
File   148:Gale Group Trade & Industry DB 1976-2005/Feb 02 (c)2005 The Gale Group .
File   160:Gale Group PROMT(R) 1972-1989 (c) 1999 The Gale Group
File   256:TecInfoSource 82-2004/Dec (c) 2004 Info.Sources Inc
File   275:Gale Group Computer DB(TM) 1983-2005/Feb 03 (c) 2005 The Gale Group
File   347:JAPIO Nov 1976-2004/Aug(Updated 041203) (c) 2004 JPO & JAPIO
File   348:EUROPEAN PATENTS 1978-2005/Jan W03 (c) 2005 European Patent Office
File   349:PCT FULLTEXT 1979-2002/UB=20050127,UT=20050120 (c) 2005 WIPO/Univentio
File   474:New York Times Abs 1969-2005/Feb 02 (c) 2005 The New York Times
File   475:Wall Street Journal Abs 1973-2005/Feb 02 (c) 2005 The New York Times
File   476:Financial Times Fulltext 1982-2005/Feb 03 (c) 2005 Financial Times Ltd
File   583:Gale Group Globalbase(TM) 1986-2002/Dec 13 (c) 2002 The Gale Group
File   610:Business Wire 1999-2005/Feb 03 (c) 2005 Business Wire.
File   613:PR Newswire 1999-2005/Feb 03 (c) 2005 PR Newswire Association Inc
File   621:Gale Group New Prod.Annou.(R) 1985-2005/Feb 03 (c) 2005 The Gale Group
File   624:McGraw-Hill Publications 1985-2005/Feb 03 (c) 2005 McGraw-Hill Co. Inc
File   634:San Jose Mercury Jun 1985-2005/Feb 02 (c) 2005 San Jose Mercury News
File   636:Gale Group Newsletter DB(TM) 1987-2005/Feb 03 (c) 2005 The Gale Group
File   810:Business Wire 1986-1999/Feb 28 (c) 1999 Business Wire
File   813:PR Newswire 1987-1999/Apr 30 (c) 1999 PR Newswire Association Inc

Set	Items	Description
S1	41991	(ESTIMAT???? OR PREDICT???? OR APPROXIMAT???? OR DETERMIN?????) (5N) (INK OR TONER OR COLOR)
S2	2180	S1 (5N) (COST OR COSTING OR PRICE OR PRICING OR RATE OR RATING OR FEE OR FEEING OR CHARGE OR CHARGES OR CHARGING OR BILL OR BILLING)
S3	129908	RED (5N) (CYAN OR MAGENTA OR YELLOW OR BLACK OR (COLOR (N) SPACE))
S4	86247	GREEN (5N) (CYAN OR MAGENTA OR YELLOW OR BLACK OR (COLOR (N) SPACE))
S5	94062	BLUE (5N) (CYAN OR MAGENTA OR YELLOW OR BLACK OR (COLOR (N) SPACE))
S6	16284	(OPTICAL OR LIGHT) (5N) (INK OR PRINT)
S7	15298	S3 (S) S4 (S) S5
S8	576	S6 AND S7
S9	57083	(DENSITY OR AREA OR COVERAGE OR DARKNESS) (5N) (INK OR TONER OR COLOR)
S10	107	S2 (10N) S9
S11	39	S2 AND (S7 OR S8) AND (S9 OR S10)
S12	38	RD S11 (unique items) [Scanned ti,pd,kwic all]

ABSTRACT: An imaging device is enabled to stabilize toner mass usage by implementing a closed loop feedback system. Actual toner mass per area used is compared with a target mass per area reference to produce an error signal for modifying toner consumption in the imaging device. A method for stabilizing toner mass consumption in an imaging device includes calculating first indicia indicative of an actual mass per area of toner consumed in the imaging device, comparing the first indicia with second indicia indicative of a target mass per area of toner consumed, and modifying toner consumption in the imaging device based on the comparing. In a preferred embodiment, a toner level sensed is compared to an original toner reference amount to produce a toner mass used. Pixels rendered are tracked to calculate a total area imaged relative to a time frame established in association with the original toner reference amount. The total mass used is divided by the total area imaged to produce the actual mass per area used. Toner consumption is modified using laser pulse width modulation or pixel masking such that subsequent actual mass per area of toner consumed approaches the target mass per area.

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Abstract Paragraph - ABTX (1): An imaging device is enabled to stabilize toner mass usage by implementing a closed loop feedback system. Actual toner mass per area used is compared with a target mass per area reference to produce an error signal for modifying toner consumption in the imaging device. A method for stabilizing toner mass consumption in an imaging device includes calculating first indicia indicative of an actual mass per area of toner consumed in the imaging device, comparing the first indicia with second indicia indicative of a target mass per area of toner consumed, and modifying toner consumption in the imaging device based on the comparing. In a preferred embodiment, a toner level sensed is compared to an original toner reference amount to produce a toner mass used. Pixels rendered are tracked to calculate a total area imaged relative to a time frame established in association with the original toner reference amount. The total mass used is divided by the total area imaged to produce the actual mass per area used. Toner consumption is modified using laser pulse width modulation or pixel masking such that subsequent actual mass per area of toner consumed approaches the target mass per area.

Summary of Invention Paragraph - BSTX (4): [0003] In electrophotographic (EP) printing, such as in laser printers and copiers, a pattern of electrostatic charges corresponding to a print image is developed on an optical photoconductor (OPC) using radiated energy, either visible spectrum light or optical energy outside the visible light spectrum. Conventionally, near infrared laser light is used to develop an electrostatic image on the OPC. The OPC is usually a continuous surface such as a drum or belt.

Summary of Invention Paragraph - BSTX (8): [0007] Regardless of whether a full laser diode pulse is applied to develop a full sized pixel, or whether the laser is modulated using PWM to develop a sub pixel, the amount of toner mass that is applied to the exposed area is critical to the quality of the resultant image that is transferred to media. Additionally, excessive toner that is unnecessarily developed onto the pixel or sub pixel is wasted. For example, too much developed toner mass tends to cause toner scatter, which is a dusting or blurring of the resultant image by the excess/wasted toner. This occurs in both monochrome and color imaging systems. This problem is magnified when the print engine utilizes an intermediate transfer belt. Print quality degradation is especially noticeable when printing text and fine detail because a cloud of toner surrounds the characters making them unclear. Additionally, toner scatter is exaggerated in connection with media that moves slower through the fusing system, such as with glossy paper.

Summary of Invention Paragraph - BSTX (9): [0008] Clearly, the EP printing process is inherently unstable with respect to toner mass development per unit area. In addition to image quality issues, this leads to difficulty in estimating toner cartridge life (toner usage) and some uncertainty in predicting the cost per page for a given print platform. If toner mass per unit area developed by the EP printing process were stable, the amount of toner consumed in printing a given page could be predicted from knowing how many of the possible dots on the page were actually printed. Although pixel (or dot) counting is conventional in the art, the accuracy of pixel counting varies from platform to platform in about the 15-25% range because of the uncertainty of actual toner mass development per unit area.

Summary of Invention Paragraph - BSTX (10): [0009] Although recent technologies have enabled more accurate toner level sensing in a toner cartridge for predicting the cartridge life (toner usage), the actual toner usage and cost per page predictability still varies from platform to platform because, again, of the uncertainty of actual toner mass development per unit area.

Summary of Invention Paragraph - BSTX (11): [0010] Accordingly, an object of the present invention is to assist in the stabilization of toner consumption for improving the estimating of toner usage and cost per page for a given print platform.

Summary of Invention Paragraph - BSTX (14): [0012] A method for stabilizing toner mass used in an imaging device includes calculating first indicia indicative of an actual mass per area of toner consumed in the imaging device, comparing the first indicia with

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second indicia indicative of a target mass per area of toner consumed, and modifying toner consumption in the imaging device based on the comparing.

Summary of Invention Paragraph - BSTX (15): [0013] Also in a preferred embodiment, a toner level sensed is compared to an original toner reference amount to produce a toner mass used. Pixels rendered are tracked to calculate a total area imaged relative to a time frame established in association with the original toner reference amount. The total mass used is divided by the total area imaged to produce the actual mass per area used. Toner consumption is modified using laser pulse width modulation or pixel masking such that subsequent actual mass per area of toner consumed approaches the target mass per unit area.

Detail Description Paragraph - DETX (2): [0019] FIG. 1 is a high level block diagram of a page printer 10 incorporating the present invention apparatus and method for stabilizing toner consumption for improving the estimating of toner usage and cost per page within the printer. Page printer 10 is controlled by a microprocessor 15 which communicates with other elements of the system via bus 20. A print engine controller 30 and associated print engine 35 connect to bus 20 and provide the print output capability for the page printer. For purposes of this disclosure, print engine 35 is a laser printer that employs an electrophotographic drum and imaging system utilizing discharge area development that is well known in the art. However, as will be obvious to those of ordinary skill in the art, the present invention is similarly applicable to other types of printers and/or imaging devices including, for example, facsimile machines, digital copiers, or the like.

Detail Description Paragraph - DETX (10): [0027] Further to the operation of printer 10 and according to principles of the present invention, Toner Stabilization Manager 85: (i) determines an actual mass per area of toner deposited onto OPC 75 (based on toner level readings from sensor 95 and based on Pixel Counter 80), (ii) calculates a mass per area error signal relative to a target mass per area signal, and (iii) modifies Toner Consumption Controller algorithm 82 for stabilizing toner consumption in printer 10.

Detail Description Paragraph - DETX (12): [0029] Additionally, during operation of print engine 35, Pixel Counter 80 continually counts pixels rendered and tracks the sum (or integral) 225 of such pixels to produce a value or signal indicative of a total Area Printed by the rendered pixels. The total Area Printed is determined based on a reference in time that corresponds to when the toner mass reference amount 205 was determined. Consequently, 235, for this referenced operation interval or time frame, Toner Stabilization Manager 85 divides the Mass Printed 220 by the Area Printed 230 to produce a value or signal indicative of an Actual Mass/Area 240 amount of toner utilized by printer 10.

Detail Description Paragraph - DETX (13): [0030] Importantly, now, Toner Stabilization Manager 85 compares 245 the Actual Mass/Area 240 with a Target Mass/Area 250. The Target Mass/Area is a value or signal indicative of a desired

amount of toner mass/area to be used by printer 10. The Target Mass/Area is established by one or more factors that affect one or more operational parameters of printer 10, such as image quality or cost per page. For example, if a slightly less quality image is an acceptable factor (i.e., by using/developing less toner on the image), then the Target Mass/Area is set to a lower value and, consequently, the cost per page is reduced. On the other hand, if image quality is of prime importance, then the Target Mass/Area is set to an increased value and, consequently, the cost per page is increased. In any case, the Target Mass/Area may be set independent of current operational settings/results of printer 10 or, alternatively, relative to the current operational settings/results of printer 10. Additionally, the Target Mass/Area signal or value is input to printer 10 from an external source by conventional means such as software (i.e., print driver) in communication with printer 10, or a control panel of printer 10 in communication with firmware in ROM 55.

Detail Description Paragraph - DETX (14): [0031] The comparison 245 of the Actual Mass/Area 240 and the Target Mass/Area 250 produces a Mass/Area Error Signal (value) 255. The Mass/Area Error Signal is then introduced into the Toner Consumption Controller procedure 82 to modify toner consumption accordingly in print engine 35. For example, if the Mass/Area Error Signal is indicative of a need to reduce the Actual Mass/Area of toner to approach the Target Mass/Area (i.e., to reduce toner consumption and cost), then Toner Consumption Controller 82 responds to the Error Signal and modifies pixel development 260 accordingly for print engine 35. For example, in a preferred embodiment, if toner consumption is to be reduced, pixel development is modified by varying the laser's 70 pulse width modulation (PWM) signals for print engine 35. Alternatively, reduced pixel development occurs by using a checkerboard development pattern (mask), a draft/economy print mode, or other reduced print quality or toner saving modes conventional in the art.

Detail Description Paragraph - DETX (15): [0032] Clearly, the present invention closed loop feedback drives the Actual Mass/Area 240 to match the Target Mass/Area 250 whereby stabilization of toner usage is achieved for improving the estimating of toner usage and cost per page for printer 10.

Detail Description Paragraph - DETX (17): [0034] Subsequently, 315, an Actual Mass/Area of toner used is calculated by dividing the actual Mass Printed by the actual Area Printed. Then, 320, the Actual Mass/Area is compared to a Target Mass/Area and an error value is generated 325. The Target Mass/Area is input at a control panel of the imaging device or via a software driver configuration. The error value is used 330 by a toner consumption control procedure to modify pixel development in the imaging device such that the Actual Mass/Area of toner usage approaches the Target Mass/Area, thus stabilizing toner consumption to the Target Mass/Area. Again, pixel development modification is accomplished using pulse width modulation, pattern mask, draft/economy print mode, or other reduced print quality or toner saving modes.

Detail Description Paragraph - DETX (18): [0035] Referring now to FIG. 4, a timing diagram depicts three signals "A", "B" and "C" representing exemplary clock pulses

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that may be applied to laser driver 65 for pulsing laser 70 as controlled by Toner Consumption Control procedure 82 for modifying pixel development 260 under the present invention. These signals represent a preferred method of using laser pulse width modulation (PWM) for modifying pixel development in order to stabilize toner consumption in response to the Mass/Area Error Signal 255.

Claims Text - CLTX (2): 1. A method of stabilizing toner consumption in an imaging device, comprising: (a) calculating first indicia indicative of an actual mass per area of toner consumed in the imaging device; (b) comparing the first indicia with second indicia indicative of a target mass per area of toner consumed, the comparing producing a compare result; and, (c) modifying toner consumption in the imaging device based on the compare result.

Claims Text - CLTX (3): 2. The method of claim 1 wherein calculating the first indicia includes calculating a mass amount of toner used by the imaging device, calculating an area imaged by the imaging device, and then dividing the mass by the area to obtain the actual mass per area of toner consumed.

Claims Text - CLTX (7): 6. The method of claim 1 wherein the compare result includes a toner mass per area error signal indicative of a difference in the actual mass per area of toner consumed and the target mass per area of toner consumed.

Claims Text - CLTX (13): 12. A method of imaging in an imaging device, comprising: (a) detecting a current amount of toner in the imaging device; (b) calculating a mass amount of toner consumed in the imaging device by comparing the current amount with a reference amount of toner; (c) determining an area imaged by the imaging device relative to a time frame established in association with the reference amount of toner; (d) calculating an actual mass per area of toner usage based on the mass amount of toner consumed and the area imaged; (e) comparing the actual mass per area with a target mass per area to produce a compare signal; (f) modifying toner usage in the imaging device based on the compare signal such that the actual mass per area of toner usage subsequently approaches the target mass per area.

Claims Text - CLTX (17): 16. An imaging device, comprising: (a) a print engine; (b) means for calculating first indicia indicative of an actual mass per area of toner consumed in the print engine; (c) means for comparing the first indicia with second indicia indicative of a target mass per area of toner consumed, the comparing producing a compare result; and, (d) means for modifying toner consumption in the print engine based on the compare result.

Claims Text - CLTX (19): 18. The imaging device of claim 16 wherein the compare result includes a toner mass per area error signal indicative of a difference in the actual mass per area of toner consumed and the target mass per area of toner consumed.

PGPUB-DOCUMENT-NUMBER: 20050007621
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050007621 A1
TITLE: Method and apparatus for determining toner level in electrophotographic print engines
PUBLICATION-DATE: January 13, 2005
INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Barry, Michael W.	Duluth	GA	US	
Bartholmae, Jack N.	Duluth	GA	US	
Rowe, Francis A.	Duluth	GA	US	
Tompkins, E. Neal	Atlanta	GA	US	
Zuber, Peter A.	Norcross	GA	US	

US-CL-CURRENT: 358/1.14, 358/300 , 358/504 , 399/27

ABSTRACT: The toner in the toner cartridge is determined by taking each of the rasterized images output by the RIP and evaluating the pixel levels over the surface thereof. The average value is determined as a percentage of the maximum toner that can be applied to the page. This is then subtracted from a toner value and a remaining toner level determined. Further, all pages of the rasterized document can be evaluated to predetermine the toner level after printing. If this falls below a predetermined minimum, printing is inhibited for that document.

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Summary of Invention Paragraph - BSTX (10): [0008] The present invention disclosed and claimed herein comprises a method for determining the actual toner density level in a toner cartridge for a printer. Each page in a multi-page document is rasterized and then the rasterized image evaluated to determine what percentage of the pixels are turned on and to what level they are turned on. An average value is then generated to determine the percent toner relative to a full page that is to be utilized by the printer. When the page is printed, a toner density value register is decremented such that the toner density value will represent the toner that remains in the cartridge.

Summary of Invention Paragraph - BSTX (11): [0009] In another aspect of the present invention, each page of the multi-page document is rasterized and evaluated prior to printing. The toner usage for the entire document is then decremented from the toner density value and this value compared to a minimum value. If it falls below the minimum value, then printing is inhibited.

Detail Description Paragraph - DETX (78): [0124] With respect to duplex printing, duplexing can be performed by a dedicated engine or, with an engine that does not have an automatic duplex feature, a "work-and-turn" procedure is utilized. In this procedure, after the first sides are printed, the lights on the print station console blink red and send a message to reload the paper. The operator then removes the sheets printed on one side from the output of the print engine 408, turns them over and places them in the input

tray. The process then prints the other side and places them into the output bins. The result is pre-sorted output of the entire job. The operator then moves from one machine to the next, putting the sets in one collated stack. If needed, slip sheets fed from the printers' manual input trays can be inserted between jobs or between copies, these being separator sheets. This technique can be facilitated, since the system has stored the individual pages and associated with those pages information regarding which job it is associated with and the page number it is associated with. Therefore, once the job is rasterized and the compressed bit image is stored, it is only necessary to extract the even-numbered pages, print them, turn over the documents, and then print the odd-numbered pages.

Detail Description Paragraph - DETX (120): [0166] Referring now to FIG. 28, there is illustrated a flowchart depicting the operation wherein the lookup table is created. The flowchart is initiated at a block 626 and then proceeds to a block 628 to set the lookup table to a 1:1 ratio, such that when an 8 bit value is input to the transform block 558 of FIG. 23, the same 8 bit value is output. The program then flows to a function block 630, wherein a test pattern is set to the output device and printed. This test pattern consists of four bands of 256 steps each, each step being a different density of toner, associated with each of the expected 8 bit values. These 8 bit values extend from 0 to 256. In general, the 8 bit values for each of the colors cyan, magenta, yellow are equal. The program then flows to a function block 632, wherein this pattern is read into the colorimeter. The colorimeter is of the type X-rite DTP51 calorimeter. This is to be distinguished from a densitometer, which measures only the reflectants from a surface to determine density. The colorimeter is based upon measurement of wavelength and determines the percentage of the XYZ space, this being "device independent" color. As such, different devices can have the same density reading with a densitometer, but a different percentage reading with the colorimeter.

Detail Description Paragraph - DETX (123): [0169] Referring now to FIG. 30, there is illustrated a flowchart depicting the above noted operation with respect to the calibration procedure for bi-level and quad-level. This program is initiated at a block 654 and then proceeds to a block 656 to create the pattern for the bi-level test. The program then flows to a function block 658 to visually examine the patches for the most perceptively gray patch. The program then flows to a function block 660 wherein the correction factor is determined for each color at maximum density. This correction is then stored as an offset for maximum density at the bi-level and quad-level formats, as indicated by a function block 662. The program then flows to an end block 664.

Detail Description Paragraph - DETX (131): [0177] In an alternate mode of operation, the toner level determination can be utilized to make a determination as to whether to print a particular page. This determination is made as a function of either the cost of a document or the level of toner in a particular print engine. In a first example, consider a large document that has multiple colors associated therewith. The user can input information as to cost of the toner as a criteria for printing. If the amount of toner can be determined prior to printing, then the amount of toner required for a particular job can be determined. With information as to the amount of toner required and the cost of

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the toner, the total cost of the job can be determined prior to actually printing the job. If the cost is too great, then the printing operation can be terminated. This can only be facilitated by a system that can make a fairly accurate estimation of the amount of toner that is required for a particular job.

Claims Text - CLTX (11): 10. A method for determining the approximate toner level in a toner cartridge in a designated print engine that is to handle a defined input job, comprising the steps of: rasterizing an input data file associated with the defined input job into individual pages; determining the amount of toner that is to be disposed on each page of the defined input job prior to printing the page by accumulating in a toner density register the toner values of the non-zero valued pixels present in a given rasterized image, wherein the non-zero valued pixels have a plurality of different values; printing the image; and decrementing a toner count value for the designated print engine by a defined amount associated with the characteristics of the designed print engine and the determined amount of toner to be disposed on the given page.

Claims Text - CLTX (12): 11. The method of claim 10, wherein a multi-page document is received and all of the pages are rasterized and further comprising the step of determining the amount of toner for the entire document prior to [printing and then determining if sufficient toner is available in the toner module by comparing the toner density register value with a predetermined value and inhibiting printing if the toner density register value is less than the determined amount of toner for the rasterized multi-page document.

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PAT-NO: JP403202978A
DOCUMENT-IDENTIFIER: JP 03202978 A
TITLE: COLOR REPRODUCTION PREDICTION METHOD RELATED TO XYZ VALUE OF DOT HALFTONE PICTURE
PUBN-DATE: September 4, 1991
INVENTOR-INFORMATION:
NAME
ATOZAWA, NAOHITO
SHIGENAGA, SATORU
IINO, KOICHI
MATSUYAMA, MORIATSU
INT-CL (IPC): G06F015/70

ABSTRACT:

PURPOSE: To automate the prediction of color reproduction quality by predicting color reproduction related to the CIE standard color specification system three simulation values X, Y, Z values of the transmission light of an ink film layer and each tone reproduction related to the XYZ value of a system consisting of a single color ink film layer and its supporting body from the combination of the value of the dot area rate of each dot halftone picture.

CONSTITUTION: A data is fetched into a processing system as a picture data 5 quantized to the dot area rate by a process scanner 1, and converted into a picture data 6 of a XYZ color specification system. In such a case, the color reproduction related to the CIE standard color specification system three stimulation values X, Y, Z values of the transmission light of the ink film layer of the dot halftone picture and the tone reproduction related to the XYZ value of the system consisting of the single color ink film layer and its supporting body, is predicted from the combination of the value of the dot area rate of each color of the halftone picture with reproduction to be predicted. Thus, the XYZ value of the reproduced color can be accurately predicted from the value of the dot area rate of each color of the dot halftone picture without relying on the experience and eye measurement of an operator, and the prediction evaluation of the color reproduction quality can be automated.

US-PAT-NO: 4233663
DOCUMENT-IDENTIFIER: US 4233663 A
TITLE: Apparatus for estimating a necessary amount of ink
DATE-ISSUED: November 11, 1980
INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Sugawara; Kazuo	Tokyo	N/A	N/A	JP
Sanada; Sei	Tokyo	N/A	N/A	JP
Kobayashi; Yosiharu	Yokohama	N/A	N/A	JP

US-CL-CURRENT: 358/296, 101/170 , 101/DIG.45 , 101/DIG.47 , 358/3.29 , 358/406 , 358/465 , 358/501 , 358/504

ABSTRACT: There is provided an apparatus for estimating a necessary amount of ink for printing which comprises a reading head for scanning an original print to produce analog signals representing the optical densities of the picture dots of the original print, an A-D converter for converting the analog signal from the reading head into digital signal representing one of 256 optical density levels of the picture dot on the original print, a plurality of level counters for classifying the digital signals from the A-D converter into 256 groups each including the digital signals representing the same optical density level and counting the digital signals for each group, and a system controller for multiplying the number of digital signals in each group and the amount of ink required to print the picture dot at a corresponding optical density level to produce the total amount of ink required to print all the picture dots on the original print.
5 Claims,   5 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 5

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Abstract Text - ABTX (1): There is provided an apparatus for estimating a necessary amount of ink for printing which comprises a reading head for scanning an original print to produce analog signals representing the optical densities of the picture dots of the original print, an A-D converter for converting the analog signal from the reading head into digital signal representing one of 256 optical density levels of the picture dot on the original print, a plurality of level counters for classifying the digital signals from the A-D converter into 256 groups each including the digital signals representing the same optical density level and counting the digital signals for each group, and a system controller for multiplying the number of digital signals in each group and the amount of ink required to print the picture dot at a corresponding optical density level to produce the total amount of ink required to print all the picture dots on the original print.

Brief Summary Text - BSTX (8): According to this invention, there is provided an apparatus comprising a photoelectric converter for producing analog signals representing the optical densities of the various parts of an original print; and A-D converter for converting the analog signals from the photoelectric converter into digital signals representing the optical densities of unit areas of the original print; level

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counters for classifying the digital signals from the A-D converter into groups of different levels and counting the numbers of digital signals of the respective groups calculating means for calculating an amount of ink to apply on a printing plate, based on the counted numbers of the each level counters and an amount of ink of each level to apply on a unit areas of the printing plate which correspond to the digital signals and for calculating an amount of ink necessary to print one sheet by multiplying a correction coefficient by the amount of ink thus calculated; and a display device for displaying the amount of ink calculated by the calculating means.

Detailed Description Text - DETX (4): The digital signals from the A-D converter 4 are serial signals. They are converted by a serial-parallel (S-P) circuit 50 into parallel signals, whereby the digital signals will be later processed easily by a computer easily. The outputs of the S-P circuit 5 are supplied to a regulating circuit or to a tone control circuit 6. The circuit 6 regulates the optical densities of the original print 2 to correct color densities which are to be corresponded to printing plate. The parallel digital signals from the circuit 6 are stored into a core memory 7. The contents of the core memory 7 are recorded on a test chart 8 and at the same time supplied to adjusting circuit 9. This circuit 9 adjusts color density to be printed to desirable color. A checker checks the data recorded on the test chart 8 and, if necessary, operates the adjusting circuit 9.

Detailed Description Text - DETX (20): Using the apparatus according to this invention, a three colorgravure plate was prepared and the necessary amount of ink was estimated. The size of the plate was 510 mm.times.1000 mm. The printing was conducted at 25.degree. C., humidity 60%, using an ink the temperature and SUS viscosity of which were 24.5.degree. C. and 30 seconds, respectively. The printing speed was 40 mm/min, the printing length was 1000 m, and the doctor pressure was 3 Kg. Under these conditions of printing, 43% of the ink to fill up the ink cells of the plate was known to be transferred onto the printing paper. Using this ink transfer rate as a correction coefficient, the necessary amount of ink was estimated to be 2.3 Kg/1000 m. After printing, it was found that 2.2 Kg of ink was consumed per 1000 m. This proved that the apparatus had accurately estimated the necessary amount of ink.

Detailed Description Text - DETX (22): The above described embodiment of this invention is so designed as to produce a gravure printing plate, Instead, this invention may be employed to produce a lithographic plate or a halftone block. If the invention is applied to lithographic or letterpress printing, the ROM 14 stores area data which represent the ratio of the screen dot in unit screens on the printing plate since the ratio determines the color densities of various parts of a printed sheet.

Claims Text - CLTX (2): a photoelectric converter for producing analog signals representing the optical densities of the various parts of an original print;

Claims Text - CLTX (3): an A-D converter for converting the analog signals from the photoelectric converter into digital signals representing the optical densities of unit areas of the original print;

Claims Text - CLTX (5): calculating means for calculating an amount of ink to apply on a printing plate, based on the counts of each level counter and an amount of <u>ink to apply on each of the unit areas</u> of the printing plate which correspond to the digital signals and for calculating an amount of ink necessary to print one sheet by multiplying a correction coefficient by the amount of ink thus calculated; and

Claims Text - CLTX (8): 3. An apparatus according to claim 1 or 2, wherein the amount of <u>ink for every unit area corresponds to the volume of an ink</u> cell formed in a gravure plate.

Claims Text - CLTX (9): 4. An apparatus according to claim 1 or 2, wherein the amount of <u>ink for every unit area</u> corresponds to the area of an unit screen of a lithographic plate.

Claims Text - CLTX (10): 5. An apparatus according to claim 1 or 2, wherein the amount of <u>ink for every unit area</u> corresponds to the area of a halftone block.

US-PAT-NO: 4422765
DOCUMENT-IDENTIFIER: US 4422765 A
TITLE: Off-set printing ink consumption prediction
DATE-ISSUED: December 27, 1983
INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Hoffman; Ernst R.	Atglen	PA	19310	N/A

US-CL-CURRENT: 356/432, 101/DIG.45 , 250/237G , 356/444 , 356/445

ABSTRACT: Glass screens with different line numbers are used to determine the photoelectric scanning and sampling rates which provide signal samples reliably representative of the density of the off-set image dot structure. Using these rates, the corresponding ink consumption values are determined, totaled over the image, and displayed.
6 Claims,   2 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 2

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Abstract Text - ABTX (1): Glass screens with different line numbers are used to determine the photoelectric scanning and sampling rates which provide signal samples reliably representative of the density of the off-set image dot structure. Using these rates, the corresponding ink consumption values are determined, totaled over the image, and displayed.

Brief Summary Text - BSTX (3): For example, printing firms are frequently asked, by the originator of the material to be printed, to submit bids for the printing work to be performed. Ink is one of the major factors in the cost of the printing operation. In turn, the quantity of ink required to produce a particular printed image varies widely, depending upon the content of the image. If the image is to have a comparatively "dense" appearance, then more ink will be required than if it is to have a comparatively "light," or pale appearance.

Brief Summary Text - BSTX (9): It hardly needs to be pointed out that this represents an exceedingly difficult task. There is a virtually infinite variety of image contents. This variety involves not only variations in density, but also variations in hue for color printing. In addition, different ink which could be used to form the very same ultimate printed image have different characteristics, which require these inks to be used in different quantities. Likewise, different print support materials, e.g. paper, fabric, plastic, all call for applications of different ink quantities.

Brief Summary Text - BSTX (12): This involved the following. First there was performed photoelectric line-by-line scanning of the original image from which the actual printing plates were subsequently to be made. The resultant electrical signals, which represent the density of the scanned lines of that original image, were then

sampled at periodic intervals, in order to determine their magnitude at each sampling interval. These magnitudes were then "translated" into corresponding values of printing ink quantity required to achieve the corresponding image density in the ultimate printed image. Finally, these ink quantity-representative values were accumulated or totalled for all the samples derived from a particular image. This total then corresponded to the total amount of ink required for the printing of that image.

Detailed Description Text - DETX (2): Overlying sheet 10 is another sheet 11 which is shown in broken lines because it is present only during part of the procedure embodying the present invention. This sheet 11 does not bear an image to be reproduced. Rather, sheet 11 is a glass conventional screen such as is used in printing technology. A photoelectric scanner 12 is provided, which is constructed and arranged so as to scan line-by-line the image-bearing sheet 10. Control means 13 is provided for adjusting the rate at which this line-by-line scanning operation is performed. Through the operation of the photoelectric scanner 12 at the rate determined by control means 13, there is produced at the output of the scanner 12 an electrical signal which varies in intensity in accordance with the density of the contemporaneously scanned lines of the image on sheet 10. This signal from scanner 12 is then periodically sampled in a sampler 14. The rate at which this sampling operation is performed is subject to variation by sampling rate control means 15. As a result of the sampling operation, the electrical signal which represents the density of the image lines scanned by photoelectric scanner 12 is broken up into separate signal portions or samples, representing the density of line segments, or dots scanned by the photoelectric scanner 12 on image-bearing sheet 10. These density-representative signal samples from sampler 14 are then supplied to a sample value translator 16. Also supplied to this sample value translator 16, from a source 17, are signals which vary as a function of the relationship between various image densities and the quantity of printing ink which is necessary to produce an image of that particular density during printing. For each image density-representative signal sample from sampler 14, translator 16 selects the ink quantity-representative value from source 17. The ink consumption-representative signal thus selected is then transmitted to accumulator 18. In accumulator 18 there are accumulated, or added together, all of the signals from source 17 thus selected consecutively over the entire image-bearing sheet 10. A running total of these accumulated values may be visually displayed on display 19 or, at least, the final total so accumulated from scanning the entire image-bearing sheet 10 is so displayed.

Detailed Description Text - DETX (9): It is now believed to be apparent that the essential differences between the present invention and my previously mentioned new technique for predicting ink consumption which is referenced in the Gravure Technical Association Magazine mentioned above, is that the present invention involves making an initial determination of the requirements of the particular image to be processed with respect to scanning and sampling rates and then adjusting these rates accordingly. This is predicated on the recognition that the fixed scanning and sampling rates employed in my prior new technique is inherently incompatible with off-set image processing. More particularly, I have recognized that the interaction between a particular fixed scanning and sampling rate, and many of the possible dot patterns which arise from the use of

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various screens in the production of off-set images, create sampled signal values which do not faithfully represent the density of the off-set image. In the extreme case, it is even possible for all of the signal samples to be taken at intervals which correspond to those points in the image which have no image-representing dots at all, but rather which lie in the spaces between image dots. In that extreme case, my prior new technique would provide an indication of essentially zero image density and, correspondingly, there would be made a prediction of minimal ink consumption. This would not be at all in accordance with reality, since the image density might actually be quite high and therefore require a large ink consumption.

US-PAT-NO: 5204699
DOCUMENT-IDENTIFIER: US 5204699 A
TITLE: Apparatus for estimating toner usage
DATE-ISSUED: April 20, 1993
INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Birnbaum; David	Pittsford	NY	N/A	N/A
Palermo; Steven M.	Rochester	NY	N/A	N/A
Ross; Douglas A.	Rochester	NY	N/A	N/A

US-CL-CURRENT: 347/131, 347/130 , 347/140 , 399/27

ABSTRACT: The present invention is an apparatus and method adaptable for use in a printing system, to measure the mass of toner developed on an electrostatic latent image produced therein. The printing system employs an electrostatic process to produce a printed sheet in response to a plurality of image intensity signals. The toner mass measuring apparatus sums a plurality of individual toner mass signals, generated as a function of the image intensity signals, to approximate the toner mass used to develop the electrostatic latent image.
21 Claims,   3 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 3

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Brief Summary Text - BSTX (25): U.S. Pat. No. 3,409,901 discloses a xerographic system in which a toner concentration control system feeds toner to the developing mechanism in proportion to the area and density of the print. A cathode-ray tube (CRT) is used to expose a photoconductive member, and the signal which drives the CRT is also provided to a toner feed signal means where the signal is summed. When the signal exceeds a predetermined level an output signal is generated to cause toner to be dispensed into the developer mechanism.

Brief Summary Text - BSTX (26): U.S. Pat. No. 4,065,031 describes a device for regulating the dispensing of toner particles to a developer mix. During the operation of an electrostatographic printing machine a sensing mechanism, including a photosensor for determining the density of toner developed on a photoreceptor, outputs signals indicative of the toner concentration. The signals are summed and processed to determine if additional toner should be added to the developer mix.

Brief Summary Text - BSTX (27): U.S. Pat. No. 4,721,978, the relevant portions of which are hereby incorporated by reference, discloses an apparatus for controlling the concentration of toner particles used to form a highlight color document. Three signals are generated and processed to regulate the dispense rate of toner particles used to form the highlight color portion of the output document. The first signal is an indication of the percentage of the document area arranged to have color highlighted portions thereon. The second signal corresponds to the rate of toner particle usage per

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document, as determined by a central processing unit, and the third signal indicates the number of copies to be produced. To determine the amount of highlight color toner used, the three signals are multiplied, the product of the signals being used as a control signal which corresponds to the required dispense rate.

Detailed Description Text - DETX (16): The predetermined function, also referred to as f(i), is generally a monotonic non-linear function that is determined empirically. More specifically, function f(i) is determined by developing uniformly charged regions, produced using a common image intensity level, and measuring the mass of toner attracted thereto. The toner mass is then divided by the area of the region, represented as the number of output pixels within the region, to arrive at a toner mass per output pixel. The process is repeated over the range of all possible image signal levels to produce the conversion function.

Detailed Description Text - DETX (18): Alternatively, summation block 132 may comprise a digital-to-analog converter (DAC) which would convert the toner mass signal to an analog signal, which could then be further processed by techniques well known to those skilled in the electronics arts. For example, the further processing may include averaging the analog toner mass signal over all or part of the output image, or accumulating the signal until a predetermined threshold level is reached, whereby the number of times the threshold level is reached would recorded by the summation block and stored therein. The advantage of this alternative is that it may allow the identification of specific regions within the image and, therefore, the output document that have a high toner coverage. Thus, various components of the electrophotographic printing machine may be regulated in accordance with the toner coverage in subsequent processing of the developed image, for example, the decurler as will be described below.

Claims Text - CLTX (20): 10. The electrostatic printing machine of claim 9 wherein the electrostatic latent image recording means comprises a device selected from the group consisting of a laser raster output scanner, an ionographic print head, and a light-emitting diode array.

US-PAT-NO: 6196663
DOCUMENT-IDENTIFIER: US 6196663 B1
TITLE: Method and apparatus for balancing colorant usage
DATE-ISSUED: March 6, 2001
INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wetchler; David M.	Vancouver	WA	N/A	N/A
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US-CL-CURRENT: 347/43, 347/14 , 347/40

ABSTRACT: One aspect of the present invention is a color printing system that is responsive to color information for forming images on media. The color printing system includes a determining device that determines colorant usage for a plurality of colorants. The determining device detects a balanced condition wherein colorant usage is within a nominal range and an imbalanced condition wherein colorant usage exceeds the nominal range. The color printing system also includes a colorant balancing device. The colorant balancing device responds to the imbalanced condition for altering colorant usage for compensating for the imbalanced condition.
34 Claims,   9 Drawing figures
Exemplary Claim Number: 1
Number of Drawing Sheets: 8

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Detailed Description Text - DETX (27): The imbalanced condition is a condition where ink usage deviates sufficiently from a predetermined or nominal use rate designed to accommodate a majority of applications. For nominal use rate applications, once this nominal use rate is determined, the individual ink containers 18 or ink compartments can then be sized in accordance with this nominal use rate. For example, the nominal user will tend to use more black colorant than either cyan, yellow, or magenta colorants. Therefore, the black colorant ink container 18 is initially sized larger so that for the nominal user the black ink supply will be exhausted at approximately the same time as the cyan, yellow, and magenta ink supplies. However, it is where ink usage deviates from this nominal use rate the balancing technique of the present invention is used to prevent waste.

Detailed Description Text - DETX (29): Alternatively, the controller 26 can make use of a pixel counting technique to determine either use rate for each of the ink containers 18. This technique involves keeping track of the number of pixels generated using each colorant. By counting the number of pixels generated for each colorant, the controller 26 can determine either remaining ink in the ink containers or a use rate for the various colorants. The controller 26 can then adjust the colorant usage if the use rate deviates from a standard or nominal use rate. This nominal use rate can be a use rate for the standard user or can be a use rate for the particular user. In the case where the nominal

use rate is for the particular user, a history of colorant use is maintained to determine a nominal use rate for this user.

Detailed Description Text - DETX (30): Instead of adjusting colorant usage rate after an imbalance occurs, the controller can predict that imbalances will occur and adjust colorant usage prior to an imbalance condition. This method of prediction requires that the remaining ink be known and a colorant use rate is inferred. As discussed previously, the remaining ink can be determined from ink level sense information or pixel generation counting. The use rate can be inferred based on a standard colorant use rate store in the controller 26 or from a history colorant use for the particular user. The controller 26 can predict which colorant will be exhausted first and adjust colorant usage accordingly.

Detailed Description Text - DETX (34): Once the CMYK color value is determined, the precise drop position or positions is determined by the device 64. The drop position control device 64 converts the CMYK values to half-tone values corresponding to the number of drops of CMYK ink for each printer pixel position. Half-toning is typically used because color ink-jet printers provided with three colorants of ink and black cannot print pixel colors having 256 levels of intensity as provided by the RGB values. Use of half-toning allows the overall color tone in an area on the print medium to closely match the color specified by the RGB value. A typical half-toning technique that is commonly used is error diffusion.

Detailed Description Text - DETX (38): If adjustments are made frequently enough, colorant usage will tend to be equal to or nearly equal to the predetermined nominal usage profile. The colorant use rate adjustments should be very small adjustments so that these adjustments do not result in noticeable hue shifts. In one embodiment these adjustments correct a use rate imbalance over a range of 50 to 300 color pages printed. In addition, the colorant use rate adjustment should not be made during the printing of a page. Adjustments on the same page can result in a noticeable hue shift on that page. Ink usage that approximates the nominal ink usage rate results in each of the ink containers 18 exhausting its supply of ink at approximately the same time. As discussed previously, exhausting the ink supply at the same time reduces waste and minimizes user intervention.

Detailed Description Text - DETX (39): Another technique for colorant usage balancing involves the balancing of black, magenta, and cyan colorants. This technique makes use of selectively using cyan and magenta colorants in black regions such as within text characters. Cyan and magenta inks increase the optical density, and if used sparingly such as less than 30 percent, any hue shift is unnoticeable. Using this technique, black ink is conserved at the expense of cyan and magenta inks. Alternatively, magenta or cyan ink can be mixed with black to increase the use rate of either of these inks. Larger amounts of cyan and magenta can be mixed with black colorants if a noticeable hue shift is tolerable.